## REMARKS

***Status of the Claims***

Claims 29-40 and new claim 41 are pending, with claim 29 being the only independent claim presently pending. New claim 41 has been added, further clarifying that the heterodiamondoid-containing probe has at least one carbon atom in the lattice replaced with a heteroatom and can have an additional heteroatom in the interstitial sites of the lattice as well, as defined at page 15, liens 19-25. As such, no new matter has been added.

Applicants respectfully request the Examiner to reconsider and withdraw the outstanding rejections in view of the foregoing amendments and the following remarks.

***Objections to the Specification***

The Examiner objected the specification because the proper noun "Verber" is misspelled. The specification has been amended herein to change "Verber" and its permutations to "Veber" and its permutations. Accordingly, Applicants respectfully request that this objection to the specification be withdrawn.

***Objections to the Drawings***

The drawings have been objected to under 37 C.F.R. 1.84(p)(4). More specifically, the Examiner states that the reference character "1001" is used to represent both the "diamondoid-containing material" and the "molecular crystal." Applicants respectfully submit that reference character "1001" was intended to represent "diamondoid-containing material" in both of its uses.

Accordingly, at page 28, line 6-7, the specification has been amended to recite "within the diamondoid-containing material 1001 to achieve the desired photoluminescing light properties." As a result, the reference character "1001" now only refers to the "diamondoid-containing material." Thus, Applicants respectfully submit that the objection to the drawings be withdrawn.

***Claim Rejections under 35 U.S.C. § 112***

Claims 29-40 stand rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite. In claims 29, 36, and 38, the Examiner alleges that the term

"heterodiamondoid" is indefinite. In claim 35, the Examiner alleges that More particularly, the Examiner asserts that the essential structural cooperative relationship between "diamondoid" and "vacancy or pore" is not clear; the essential cooperative structural relationship between "diamondoid lattice" and "vacancy or pore" is not clear; the essential cooperative structural relationship between "diamondoid lattice site" and "vacancy or pore" is not clear; and the essential cooperative structural relationship between "carbon atom" and "vacancy or pore" is not clear. Applicants respectfully disagree with the rejection; therefore, this rejection is respectfully traversed.

With regard to the term "heterodiamondoid", as previously stated, the specification provides exemplary synthesis of heterodiamondoids at page 15, lines 35 to page 17, line 34. Moreover, at page 18, lines 8-10, the specification refers to Chevron's earlier filed U.S. Application Serial No. 10/622,130 entitled "Heterodiamondoids", now U.S. Patent No. 7,049,374, for additional information regarding heterodiamondoids.

The term "heterodiamondoid" is explicitly defined in the specification and is well understood to a skilled artisan. At page 15, lines 19-25 of the specification, it is provided that "[t]he term 'heterodiamondoid' as used herein refers to a diamondoid that contains a heteroatom typically substitutionally positioned on a lattice site of the diamondoid crystal structure...'Substitutionally positioned' means that the heteroatom has replaced a carbon host atom in the lattice. Although most heteroatoms are substitutionally positioned, they may in some cases be found in interstitial sites *as well*." (emphasis added). Applicants respectfully submit that one of skill in the art understands that diamondoids are caged compounds of the adamantine series with a "diamondoid" topology, which means their carbon atom arrangement is superimposable on a fragment of a FCC lattice, as explained in the specification at page 10, line 22-page 13, line 11. Accordingly, diamondoids are caged compounds with a carbon atoms arranged and covalently bonded to one another in a diamondoid lattice structure.

As defined in the specification, a heterodiamondoid has one of the carbon atoms of the diamondoid structure replaced with a heteroatom. As such, one of the carbon atoms in the lattice is replaced with a heteroatom.

As further defined in the specification, a heterodiamondoid can *also* have a heteroatom found in the interstitial sites of the diamondoid lattice as well. Applicants note

that, as defined, the heterodiamondoid has a heteroatom replacing a carbon atom in the lattice with the possible additional insertion of a heteroatom in the interstitial space.

As one of skill in the art readily understands, in caged compounds or crystal structures, the atoms are arranged and bonded in a lattice structure. As a result of the packing arrangement of the atoms in the cage or crystal structure, there are interstitial spaces within the lattice. One of skill in the art also readily understands that these interstitial spaces are often referred to as vacancies or pores. As one of skill in the art further understands, atoms of an appropriate size can be inserted into these interstitial spaces (vacancies or pores). Accordingly, Applicants respectfully submit that one of ordinary skill in the art of chemistry would readily understand lattices, interstitial spaces (vacancies or pores) and the structural relationship among the lattice, atoms in the lattice, and the interstitial spaces (vacancies or pores).

Accordingly, for at least the above-reasons, withdrawal of the § 112, second paragraph, rejection is respectfully requested.

***Claim Rejections under 35 U.S.C. § 102***

Claims 29-34 and 36-40 have been rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,032,381 (*Bronstein & Voyta*). Applicants respectfully disagree with the rejection; therefore, this rejection is respectfully traversed.

The presently claimed invention recites binding a ***heterodiamondoid***-containing probe to a target analyte, thus creating a biological label and exciting the biological label with energy such that the ***biological label is caused to luminesce***. As claimed and as further explained in the specification, the heterodiamondoid-containing probe/target analyte complex luminesces so that the light emitted can be detected and the target analyte can be detected/measured. Accordingly, the heterodiamondoid itself is functionalized to create a heterodiamondoid probe that will bind to an analyte of interest and luminesce when excited. As presently claimed, it is <u>not</u> the cleaving of a functional group from the diamondoid backbone that causes luminescence.

*Bronstein & Voyta* disclose chemiluminescent compounds that are enzymatically-cleavable 1,2-dioxetanes of formula (I). (Col. 7, lines 9- 18). Formula (II) depicts a preferred enzymatically-cleavable 1,2-dioxetane including an adamantyl group. (Col. 9, lines 24-36). The Z substituent of formula (I) is cleavable by an enzyme to yield an electron-rich moiety

bonded to the fluorophore Y ring. Col. 7, lines 58-68. When an enzyme cleaves the Z substituent, the Y substituent reaches an excited energy state and emits electromagnetic radiation, preferably luminescence of visible light, to return to its original energy state. (Col. 7, lines 53-57, col. 10, lines 67-col. 11, line 4). The enzyme can be attached to a cell by the use of suitable ligands, such as an antibodies specific for cellular receptors. (Col. 11, lines 5-28).

*Bronstein & Voyta* do not disclose or suggest providing a heterodiamondoid-containing probe; binding the heterodiamondoid-containing probe to the target analyte, thus creating a biological label; exciting the biological label with energy such that the biological label is caused to luminesce; and detecting light emitted from the excited biological label.

As disclosed in *Bronstein & Voyta*, the 1,2 dioxetane of Formula (II) is not a heterodiamondoid-containing probe. A heterodiamondoid is a diamondoid that contains a heteroatom, an atom other than carbon, replacing a carbon atom in the diamondoid lattice.

The Examiner alleges that *Bronstein & Voyta* teach a "heterodiamondoid." Specifically, the Examiner states that *Bronstein & Voyta* "fold oxygen, phosphorous and metal impurity heteroatoms into an adamantyl derivative (see Formula II)." Office Action at page 11. Applicants respectfully disagree.

Formula (II) contains adamantyl, which is a diamondoid, but ***not*** a heterodiamondoid. The adamantyl is bonded to other atoms and chemical groups, but does not contain a heteroatom replacing one of the carbon atoms of the adamantly group. Looking at Formula II of *Bronstein & Voyta*, there is no heteroatom present in the adamantly structure or folded within the crystalline structure of the adamantly. There is merely a 1,2-dioxetane covalently bonded to one of the carbon atoms of the adamantly. As such, there is merely an oxygen atom covalently bonded to one of the carbon atoms of the adamantly. This is **not** a replacement of one of the carbon atoms of the adamantly structure with an oxygen and this is **not** insertion of an oxygen within the interstitial space of the adamantly crystalline structure. Thus, *Bronstein & Voyta* neither disclose nor suggest a heterodiamondoid-containing probe.

Furthermore, the 1,2-dioxetanes of *Bronstein & Voyta* do not include a heterodiamondoid having at least one functional group, which binds to the target analyte. The adamantyl group of Formula II of *Bronstein & Voyta* does not have at least one functional group that binds the target analyte. In fact, no binding takes place. Rather, an enzyme cleaves the Z group and neither the enzyme, nor a cell to which it is attached,

interacts with the adamantyl group. The sole purpose of the adamantyl group is to provide stability to the 1, 2-dioxetanes. Col. 7, line 19.

For at least the above reasons, Applicants respectfully submit that *Bronstein & Voyta* fails to anticipate claims 29-34 and 36-40. Accordingly, withdrawal of the above §102(b) rejection is respectfully requested.

Claims 29-34 and 36 stand rejected 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,514,717 (*Bronstein*). Applicants respectfully disagree with the rejection; therefore, this rejection is respectfully traversed.

*Bronstein* discloses a kit for conducting an assay to detect a substance using enzymatically-induced decomposition of dioxetanes. In particular, *Bronstein* discloses reacting an enzyme with a dioxetane having the formula set forth at col. 1, lines 35-40. The T group of the dioxetane may be adamantyl. (Col. 2, lines 19-20). Contact of the dioxetane with the enzyme cleaves group Z, excites group Y, and causes group Y to luminesce. The enzyme is bound to a detectable substance through a substance having a specific affinity for the detectable substance. Thus, the luminescence indicates that the detectable substance is present and luminescence intensity can be measured to determine the concentration of the detectable substance. Col. 11, lines 30-47.

The Examiner alleges that *Bronstein* teaches a "heterodiamondoid." Specifically, the Examiner alleges that *Bronstein* folds "oxygen, 'X', 'Y', and 'Z' heteroatoms into an adamantyl derivative (see col. 1, lines 35-40)." Office Action at page 11.

However, as described above with regard to *Bronstein & Voyta*, *Bronstein* does not disclose or suggest providing a heterodiamondoid-containing probe; binding the heterodiamondoid-containing probe to the target analyte, thus creating a biological label; exciting the biological label with energy such that the biological label is caused to luminesce; and detecting light emitted from the excited biological label.

As disclosed in *Bronstein*, the dioxetane having the formula set forth at col. 1, lines 35-40 is not a heterodiamondoid containing probe. While group T may be adamantyl, *Bronstein* does not disclose or suggest that a heteroatom may be present in adamantyl. Instead, *Bronstein* states that "[t]he most preferred molecule is an adamantyl group consisting of 3 fused cyclohexyl rings." Also as explained above, the adamantyl is bonded to other atoms and chemical groups, but does not contain a heteroatom replacing a carbon atom with

its lattice. Thus, *Bronstein* neither discloses nor suggests a heterodiamondoid-containing probe.

Further, the dioxetane of *Bronstein* does not experience binding with a target analyte. Rather, the dioxetane is exposed to an enzyme, which cleaves the Z substituent. The enzyme can be attached to a detectable substance by means of a specific affinity substance, but the dioxetane is not so attached. The dioxetane only experiences cleavage, and it is this cleavage that causes the chemiluminescence. Thus, *Bronstein* neither discloses nor suggests binding the heterodiamondoid probe to the target analyte, thus creating a biological label.

For at least the above reasons, Applicants respectfully submit that *Bronstein* fails to anticipate claims 29-36. Accordingly, withdrawal of the above §102(e) rejection is respectfully requested.

Claims 29-33 and 35-40 stand rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 6,864,103 (*Raymond et al.*). Applicants respectfully disagree with the rejection; therefore, this rejection is respectfully traversed.

*Raymond et al.* discloses phthlamide-lanthanide complexes useful as luminescent probes. The luminescent lanthanide metal chelates of *Raymond et al.* comprise a metal ion of the lanthanide series and a complexing agent comprising at least one phthalamidyl moiety. The complexes may attach to an analyte in order to detect and/or quantify the analyte. Col. 9, lines 45-55. The complexes are excited by any manner, like light or electrochemical energy, to luminesce. Col. 10, lines 45-47. A recognition moiety may be conjugated with the complex. Col. 36, lines 4-14. The recognition moiety can be a drug moiety. Col. 36, lines 38-39. One of many exemplary listed drug moieties is methenamine.

Applicants respectfully submit that *Raymond et al.* does not disclose or suggest providing a heterodiamondoid-containing probe; binding the heterodiamondoid-containing probe to the target analyte, thus creating a biological label; exciting the biological label with energy such that the biological label is caused to luminesce; and detecting light emitted from the excited biological label, as presently claimed.

Accordingly, Applicants respectfully submit that *Raymond et al.* fails to anticipate claims 29-33 and 35-40. Accordingly, withdrawal of the above §102(e) rejection is respectfully requested.

***Claim Rejection Under 35 U.S.C. § 103***

Claims 29-34 and 36-38 stand rejected under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 7,070,921 (*Huang et al.*) in view of *Bronstein*. Applicants respectfully disagree with the rejection; therefore, this rejection is respectfully traversed.

*Huang et al.* discloses assays for detecting molecular modifications such as phosphate modifications and the presence and/or activity of enzymes and other agents involved in facilitating or otherwise regulating such modifications. Abstract. *Huang et al.* discloses species and/or reactions that may be analyzed using assays. The species include reactant and product A and A*, respectively. Col. 10, lines 51-54. A and A* generally comprise any two species related by a modification. Col. 11, lines 1-2. A and/or A* may include components intended to facilitate detection of binding between A or A* and binding partner, such as a luminophore. Col. 11, lines 15-18.

The Examiner acknowledges that *Huang et al.* does not describe a heterodiamondoid-containing probe. Office Action at page 8. *Bronstein* has been cited as disclosing a heterodiamondoid-containing probe.

As described above, *Bronstein* discloses a kit for conducting an assay to detect a substance using enzymatically-induced decomposition of dioxetanes. In particular, *Bronstein* discloses reacting an enzyme with a dioxetane having the formula set forth at col. 1, lines 35-40. The T group of the dioxetane may be adamantyl. (Col. 2, lines 19-20). Contact of the dioxetane with the enzyme cleaves group Z, excites group Y, and causes group Y to luminesce.

Also as described in detail above, *Bronstein* does **not** disclose or suggest a heterodiamondoid-containing probe. The dioxetane of *Bronstein* is not a heterodiamondoid or a heterodiamondoid-containing probe.

A heterodiamondoid is a diamondoid that contains a heteroatom, an atom other than carbon, replacing a carbon atom in the diamondoid lattice.

While the dioxetane of *Bronstein* may be substituted with an adamantyl, the adamantly substituent is a diamondoid, but ***not*** a heterodiamondoid. The adamantyl is bonded to other atoms and chemical groups, but does not contain a heteroatom replacing one of the carbon atoms of the adamantly group. As described above, the 1,2-dioxetane is merely covalently bonded to one of the carbon atoms of the adamantly; however, there is **not** a replacement of one of the carbon atoms of the adamantly structure with an oxygen and there

is **not** insertion of an oxygen within the interstitial space of the adamantly crystalline structure. Thus, *Bronstein* neither disclose nor suggest a heterodiamondoid-containing probe.

Further, the dioxetane of *Bronstein* does not experience binding with a target analyte. Rather, the dioxetane is exposed to an enzyme, which cleaves the Z substituent. The enzyme can be attached to a detectable substance by means of a specific affinity substance, but the dioxetane is not so attached. The dioxetane only experiences cleavage, and it is this cleavage that causes the chemiluminescence. Thus, *Bronstein* neither discloses nor suggests binding the heterodiamondoid probe to the target analyte, thus creating a biological label.

Accordingly, Applicants respectfully submit that the combination of *Huang et al.* and *Bronstein* does not disclose all the elements of claim 29. The combination of *Huang et al.* and *Bronstein* does not disclose or suggest providing a heterodiamondoid-containing probe; binding the heterodiamondoid-containing probe to the target analyte, thus creating a biological label; exciting the biological label with energy such that the biological label is caused to luminesce; and detecting light emitted from the excited biological label.

Thus, for at least the above-noted reasons, Applicant respectfully requests that the obviousness rejection of claims 29-34 and 36-38 over *Huang et al.* and *Bronstein* be withdrawn.

***Conclusion***

Without conceding the propriety of the rejections, the claims have been amended, as provided above, to pursue an early allowance. In view of the foregoing amendments and remarks, it is believed that a Notice of Allowance is in order.

In the event that there are any questions relating to this application, it would be appreciated if the Examiner could telephone the undersigned attorney concerning such arguments so that prosecution of this application may be expedited.

If necessary to affect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to affect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #103904.B500845).

Respectfully submitted,

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